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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •

OCTOBER 1, 1932

Warning Spots or Targets?

See Page 210

A SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

VOL. XXII *No. 599*

The Weekly Summary of Current Science

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Edited by WATSON DAVIS

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? DO YOU KNOW THAT ?

The average American spends six dollars a year on medicine.

A kind of coffee that grows at Grand Comoro Island, off South Africa, contains no caffeine.

Tests by government scientists show that woodwork can be stained attractive brown shades by use of ammonia gas.

Observers are gathering data to show how much tropical heat is carried by the Gulf Stream each day toward northern countries.

One German highway is guarded by a wooden figure of a policeman with red eyes that glare brightly at night, and one hand pointing to a speed limit sign.

A new kind of floor coating contains a special pigment said to be three times harder than steel, and resistant to normal abrasion on concrete and wood floors.

The famous New England preacher Cotton Mather dared to approve inoculation for smallpox, and was attacked by having a hand grenade thrown through his window.

The owl is a natural enemy of bats.

The Navajo Indian word for motorcycle means "Son of an automobile."

To make rugs slip-proof sew a triangle of corrugated rubber under each corner.

If there were men living on the moon, they would exist in a world of complete silence.

Otters enjoy playing by sliding head first down a slope covered with snow or mud.

A mysterious new disease of wheat, yellow mosaic, which completely destroys the grain, has appeared in Kansas.

In the Hopi Indian Snake Dance, the Snake Priests use eagle feathers to herd the snakes in a given direction, since eagles are supposed to be the masters of the snakes, preying on them.

Carbonated apple juice, produced by a method worked out at a New York State Experiment Station, is hailed as a new outlet for surplus fruits.

WITH THE SCIENCES THIS WEEK

Curiosity arousing questions for the teacher and general reader. Book references in italic type are not sources of information of the articles, but are references for further reading. Books cited can be supplied by Librarian, Science Service, at publisher's price, prepaid in U. S.

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How much larger than her nearest rival will the Army's new non-rigid TC-13 airship be? p. 217.

ARCHAEOLOGY

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How large was Queen Hetepheres' portable bed-sitting room? p. 209.

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ENTOMOLOGY

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How well does the toad's color and poison protect him from his enemies? p. 210. *Effectiveness in Nature of the So-called Protective Adaptations in the Animal Kingdom—W. L. McAtee—Smithsonian Institution*, 1932, 75c.

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GEOLOGY

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How do lightning flashes affect cosmic ray counters? p. 213.

PHYSIOLOGY

To what two groups of people is carbon tetrachloride especially poisonous? p. 211.

PSYCHOLOGY

What use is suggested for the word "psychobiology?" p. 218.

PUBLIC HEALTH

Why are the general and infant mortality rates for the past year low? p. 218.

PHYSICS

Cosmic Rays Bombard Earth With 40,000 Million Volts

New Estimate Based on Evidence from Various Sources Places Energy Forty Times as High as Previously Thought

COSMIC radiation bombards the earth with energies of some 40,000 million volts, which is about forty times the highest energies usually assigned to the ultra-penetrating radiation being so intensively studied by physicists throughout the world.

The new estimate is made by Dr. Thomas H. Johnson, assistant director of the Bartol Research Foundation of the Franklin Institute, Swarthmore, Pa., who in a communication to the American Physical Society, interprets evidence obtained by various investigators and his own experiments.

It has been recognized as a result of photographs made by Dr. Carl D. Anderson at the California Institute of Technology (*SNL, Dec.* 12, 1931, *p.* 373; *Dec.* 19, 1931, p. 387.) that at least some of the tracks of particles measured and photographed in the form of water droplets in cloud chamber apparatus or detected by various sorts of electron or particle counters are not caused by primary cosmic radiation but by the secondary radiations that result from collisions of the cosmic rays with earthly materials in their path.

Interpreting the measurements of the German physicist, Dr. H. Schindler, Dr. Johnson develops the idea that the measured intensity of the radiation depends upon the particular kind of material through which the rays have just passed. This led to an estimate of the energy of each of the secondary radiations produced by one cosmic ray, which in turn allowed him to arrive at the sum of energies of the secondaries from a single primary ray at the earth's surface at some 20,000 million electron volts. Since these rays have already passed through the atmosphere, dissipating energy as they traveled, Dr. Johnson doubled this figure to obtain the energy of a cosmic ray entering the earth's atmosphere.

Such immense energies discourage the hopes of scientists that some day it will be possible to produce artificial cosmic radiation here on earth. When Dr. Robert A. Millikan estimated in his early work on cosmic rays that some cosmic rays had energies of the order of ten million volts there was hope that synthetic cosmic radiation might be produced. As research has progressed the energy assigned to cosmic rays has increased. From 100 to 1000 million volts have been the favorite figures until this latest estimate by Dr. Johnson.

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MEDICINE

Find Fever Treatment Relieves Stubborn Asthma

ARTIFICIAL fever, which has been helpful in treating paresis, is now being turned to the treatment of another ailment, chronic asthma. Thirty cases of the disease in which relief was obtained by this means have been reported to the American Medical Association by Drs. Samuel M. Feinberg, Strafford L. Osborne and Meyer J. Steinberg of Northwestern University Medical School.

In nineteen of these patients the relief of symptoms was complete and lasted from several days to nine and one-half months. In the other eleven cases, there was improvement without complete remission of the symptoms.

The fever was induced in these patients by high frequency electric currents, or diathermy. In all of the cases, other means of treating asthma had been tried without success.

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ENGINEERING

New Ventilation Standards Would Save Fuel

THE specifications of municipal building codes that govern ventilating practice in buildings throughout the United States are based on tradition and are without scientific foundation. This is the belief of the American Society of Heating and Ventilating Engineers, which seeks the establishment of new national standards under the auspices of the American Standards Association.

Fuel bills will be lowered if recommendations of the engineers are adopted, it was stated, because the new specifications reduce the amount of outside air required by present codes to a minimum of ten cubic feet per occupant per minute. However, standards are also given for temperature, humidity, air quality, movement and distribution. The recommended code is based on recent research at the Society's laboratory in Pittsburgh.

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PHYSICS

Artificial Voice and Ear Excel Human Counterparts

A MECHANICAL speaker that talks better than the human mechanism and an artificial ear that hears more effectively than man's auditory organ, for testing telephone transmitters and receivers, are at work in the Bell Telephone Laboratories in New York. This newly developed apparatus replaces the human voice and ear in research devoted to the production of telephones that will transmit speech more effectively.

An electrical phonograph is the source of the voice in the artificial speaker and a number of electrical circuits assure its natural qualities. The artificial mouth is so carefully built that its speech is distorted by objects in front (*Turn Page*)

A MAN'S WORK

The mechanical speaker is facing the mouthpiece and the artificial ear is clasping the receiver to test the telephone. It does this work better than the human voice and ear.

of it just as sounds from a human mouth are broken up, it is explained by A. H. Inglis, C. H. G. Gray and R. T. Jenkins.

Not only does the artificial speech check within a few per cent. by diagrammatic analysis with the original human product, the engineers state, but it also sounds natural. An important advantage of the mechanical mouth and ear is that they reproduce exactly the same sound and hear with precisely the same sensitiveness and distinction every time they are used. Their human counterparts vary with mood and physical condition of the person talking or listening.

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GEOGRAPHY

"Wild West" Gorges Found in Sea Bottom Off New England

By DR. FRANCIS P. SHEPARD, Department of Geology, University of Illinois; Collaborator, U. S. Coast and Geodetic Survey

A WHOLE SERIES of vast canyons, rivalling anything that the West has to offer, have been found in the bottom of the ocean off the New England coast by the U. S. Coast and Geodetic Survey during the season which has just closed. Corsair Gorge, which created something of a sensation a couple of years ago when it was first discovered, is only one feature in this stupendous submarine landscape.

This summer it was decided to examine in much more detail some of the valleys in the Corsair Gorge neighborhood, to see if they might be used as landmarks for navigators. The last survey revealed an area with such relief and irregularity that it dwarfs by comparison anything above water in eastern North America and must rival the grandest topographic features of the West. The area charted represents only the upper mile of the two-mile-high continental slope.

The preliminary contour map which I have drawn shows a series of steep-walled canyons cut thousands of feet deep into this escarpment. The least of these is deeper than the Yellowstone Canyon and the greatest must be comparable with the Grand Canyon of the Colorado.

Some geologists have attempted to show that submarine valleys are not the product of river erosion, but the valleys under discussion have every indication of a fluvial origin. They have the typical sinuous shape of river valleys, as well as the branching tributaries and the V-shaped cross sections characteristic of canyons cut by streams. Since the valley floors are traceable to depths of at least 7,000 feet, it is evident that during the valley cutting stage New England must have been a plateau a mile and a half above sea level.

The steepness of the canyon walls, probably exceeding 45 degrees in places, make it appear very probable that they were cut in solid rock rather than in the soft sediments of the ocean floor. The finding of fragments of weakly cemented conglomerate on the wall of one canyon partially confirms their rocky nature. Unfortunately only a few samples were collected since the soundings were made by echoes using the "fathometer," and it takes a long time to get samples from deep water.

The outer portions of the valleys have hummocky topography suggestive of landslide accumulations. It seems probable that the sediments which were deposited in the inner valleys after they were submerged have been shaken loose and have slid out into the outer valleys where they lodged because of the decrease in gradient.

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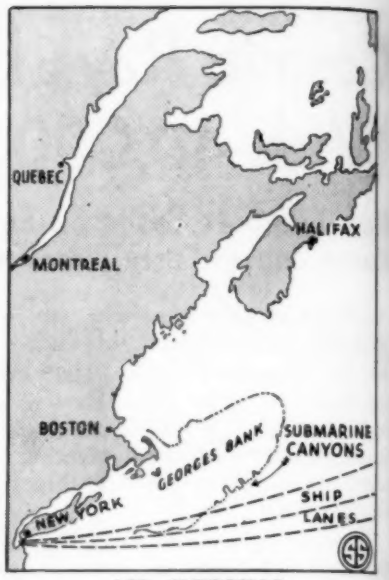

AID SHIPPING

Some trans-Atlantic liners are already using the new underwater gorges as "landmarks" to guide them safely over the dangers of Georges Bank. A sonic depth finder automatically reports the irregularities of the sea bottom. When the record shows the gorges in their expected positions, the pilot is assured that he is exactly on the right course, though fog obscures both the sun and the stars.

ASTRONOMY

Year May Bring Record For Comet Discoveries

AT LEAST one business, that of discovering comets, seems to have passed the corner. Already the record of 1927 has been equaled, and there is every likelihood that it will be surpassed. In 1927 ten comets were reported by astronomers, six new, and the rest periodic visitors on regular returns. This was a greater number than had ever before been discovered in a single year.

The figures for 1932, with more than three months yet to go, are identical with those for 1927, although one of the new discoveries this year, by A. Schmidt, of the University of Algiers, was not confirmed by later observations. Four of the 1927 comets, two of them new, were discovered during the last quarter of the year. Several periodic comets, expected this year, have not yet appeared, and thus it is quite likely that 1932 will set a new record.

The new comets of 1932 were found by H. E. Houghton, at the Royal Observatory, Cape of Good Hope, on April 1, by P. Carrasco Garrorena, at the Madrid Observatory, April 25; by Newman, at the Lowell Observatory, in Arizona, June 1; by Geddes, at the Melbourne Observatory, June 22; by Schmidt, at Algiers, on June 25, and independently by L. C. Peltier, of Delphos, Ohio, and Dr. F. L. Whipple, of the Harvard Observatory, on August 8. All these comets are now called by the names of their discoverers. In addition, two very remarkable asteroids, or tiny planets, were found, the first on March 12, by Dr. E. Delporte, of the Royal Observatory of Belgium; and the second on April 27, by Dr. K. Reinmuth, of the Konigstuhl Observatory, Heidelberg. Both of these asteroids come closer to the earth than any previously known object except the moon.

The periodic comets that have returned this year are those of Grigg-Skjellerup, Kopff, Borrelly and Faye.

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COSMOGONY

New Nebular Theory Explaining Origin of Planets Proposed

Report to Royal Academy of Sciences, Holland, Holds Earth and Other Planets Came from Disk-Shaped Nebula

A NEW nebular hypothesis of planetary origins is being discussed in Amsterdam as a substitute for the theory that the planets are fragments torn from the sun by the enormous tidal forces generated when another huge star passed too close to the sun.

The new evidence against the "tidal forces" theory is based on observations and calculations made and reported by H. P. Berlage, Jr., of the Meteorological Observatory in Batavia, Java. His paper was communicated to the Roya! Academy of Sciences by Prof. H. A. Kramers.

Disc Extended to Neptune

Berlage's theory is that the planets had their origin in a nebula surrounding the sun and having the shape of a thin, flat disk. From what is known of the way in which the present planets differ in their respective densities it follows that if there actually was such a nebula it must have had this disk shape at least as far out from the sun as Neptune. Moreover, the densities for each planet, calculated on the assumption that the new theory is correct, agree remarkably well with the actual known densities. For example, according to the theory the greatest density should be along a circle which is nearly the same as the earth's orbit. The earth is actually the most dense of the planets.

Additional supporting evidence is found in the distances of the planets from the sun. Careful examination of the known facts about these distances reveals that the figures agree much better than has ever been believed with the positions which the planets should occupy, according to this theory, with respect to the sun.

More Planetoids

If the planets did originate from a great disk-shaped nebula, it is easy to understand the presence of the great bulk of planetoids between Mars and Jupiter; they arose from an unstable and highly turbulent zone in the gaseous disk. Even the puzzling arrangement of these planetoids can be simply explained on the proposed basis.

If the theory is correct, there should have been another, lesser zone of turbulence, and so there should be another family of planetoids. It is considered probable that the recent discovery of Pluto brought to light the first known member of such a group of planetoids, thus giving the theory added confirmation; and it is suggested that if these planetoids are discovered, they might appropriately be called plutoids.

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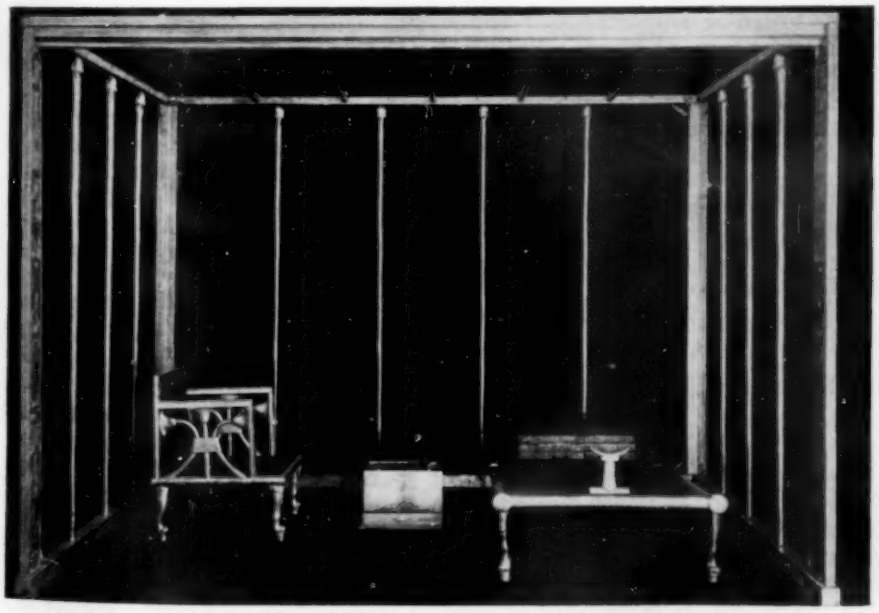

BED-SITTING ROOM: UNFOLDED FOR A QUEEN IN 15 MINUTES

Queen Hetepheres I, of Egypt 5000 years ago, apparently took her bed with her when she went from palace to palace with her husband, this discovery of the Harvard-Boston expedition reveals. An expert opinion on the nature of the wood has not been obtained, but it is thought that cedar of Lebanon was probably used.

ARCHAEOLOGY

Portable Bed-Sitting Room Made for Egyptian Queen

A PORTABLE bed-sitting room that can be set up in fifteen minutes.

No, it is not the latest equipment for automobile tourists announced in the mail order catalogs. It is an invention 5,000 years old, come to light from a royal tomb of Egypt, belonging to Queen Hetepheres I.

The Harvard - Boston Expedition, which cleared the queen's possessions from her secret tomb, recognized what the strips of gold-encased, decayed wood represented, and bent every effort to salvage the important piece of royal furniture. Dr. George A. Reisner, noted Egyptologist of the Boston Museum of Fine Arts, now reports that the restored canopy has been delivered to the Cairo Museum, where the bed and head rest belonging inside the canopy are already deposited.

Gold-Cased Posts

The queen's canopy consisted of a wooden framework 10.5 feet long, over eight feet wide and about seven feet high. When the gold-cased, wooden posts and beams were set up and curtained with fine linen hangings, the queen had a very private and comfortable little room. A bed, arm-chair, and jewel box furnished the canopied enclosure.

Describing the canopy, which was presented to the queen by her husband Sneferuw, Dr. Reisner says: "The canopy can be taken down in about fifteen minutes and set up in about the same time. There can be no doubt that this canopy was transported for the use of the queen whenever the king changed his quarters from palace to palace."

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EVOLUTION

They All Get Eaten Anyhow

An Animal's Camouflage, Sting, Bad Odor or Taste Does Not After All Save Him From His Enemies, Scientist Declares

See Front Cover

By DR. FRANK THONE

EATING, we are told by an ancient adage, is the proof of the pudding. It would also seem to be the proof of the many devices used by all manner of creatures to avoid being eaten. If an insect or other animal is colored a scary red, or hidden beneath a leaf-colored camouflage, if it is cased in armor or bristles with sharp spines, if it can bite or scratch or sting—and in spite of these devices still gets eaten, then obviously its "protection" has failed to protect. The proof of the protection is in the eating.

The strange and often beautiful colorations and markings of animals have excited the admiration of naturalists from the very earliest times, and philosophers have often speculated as to their possible uses or significance. But until the coming of the Darwinian evolutionary doctrines of struggle for existence and the resulting survival of the fittest, no logical expiration was offered for them, short of passing the problem on to the theologians by attributing them to special design by the Creator.

The Darwinian credo, that the competition between animals is so keen that everything they do either helps them to survive or hurts them toward ultimate extinction, offered an attractive key to the whole puzzle. All animal colorations and markings were eagerly examined for their "survival value," after Alfred Russell Wallace, Darwin's contemporary and co-originator of the evolutionary doctrine in its modern form, first suggested the idea a few years after the publication of the "Origin of Species."

If a poisonous spider or snake, or a sting-armed insect, was conspicuously colored or marked, that was interpreted as a warning to possible enemies, that here was a "hard guy" who wouldn't stand for any foolishness. If an inoffensive creature, really good to eat and easy to capture, happened to look like one of these evolutionary "tough babies," that was set down as "mimicry": the pacifist was disguising himself in a warrior's uniform. If on the other hand, the helpless one were brown and lean, like a walking-stick insect, or flat and green, like a katydid, or mottled and lumpy, like a toad, that was considered camouflage, to disguise the wearer as a twig or a leaf or a clod of earth.

There are endless ramifications of this theme, but from Wallace's day until now it has been accepted almost as gospel by a majority of biologists, and is set forth in all school and college textbook.

Comes now a bold heretic, W. L. McAtee of the U. S. Biological Survey, who challenges the whole idea. Animal protection, he says, does not protect. No matter what concealing, or warning, or mimicking devices a creature adopts, no matter what its armament or armor, it meets its Nemesis: some hungry enemy that cannot be either fooled or frightened, and down the red lane it goes. The so-called protective devices, Mr. McAtee insists, do not give even partial protection: all creatures are eaten in approximate ratio to their total abundance, whether they are "protected" or not. If there are few of them, few get eaten; if many, many are devoured, no matter what they look like or how they are armed. Even really dangerous or highly disagreeable ones, like snakes or scorpions or skunks, are no exception.

Experiments Held Not Valid

Twenty years ago Mr. McAtee made a critical examination of experiments supposed to establish the efficacy of protective coloration and other devices. The scientists who performed these experiments usually presented caged birds or animals with insects of various kinds, and noted whether they ate them, rejected them, or merely ignored them. Such tests, Mr. McAtee contended, were unfair. Caged animals and birds are no more to be relied on for natural reactions than are jailed men. Moreover, the number of tests was usually inadequate.

But in spite of his protest then, the doctrine still attracted. So Mr. McAtee bided his time, and while he waited he appealed to the final jury—the feeding habits of animals living free under natural conditions. Now, in a technical publication of the Smithsonian Institution, he sets forth the verdict.

He was in a uniquely favorable position to obtain the information he sought. In the Biological Survey he is in charge of the division of food habits of birds. When birds are collected for museum purposes, or occasionally when such troublesome species as starlings or crows have to be killed in large numbers, their stomach contents are saved and sent to headquarters in bottles of preservative. There they are spread out, sorted and identified by experts. The insects and other things taken as food by tens of thousands of birds have been counted and listed, and the summary is set forth in Mr. McAtee's book. In addition, he has collected feeding records of other animals from all parts of the world and put these in supplementary summaries.

The bill of fare of the wild creatures thus subjected to scientific scrutiny includes practically everything that flies or crawls or swims, and the list of eaters takes in all living things except the strictest vegetarians. It all goes very

POISONOUS, BUT EATEN

The toad, clod-colored and clod-immobile, might surely be classed as protectively colored. Moreover, he is poisonous when eaten. Nevertheless he does get eaten in considerable numbers, and his enemies grow fat on him.

COVER ILLUSTRATION

Eye-spots, like those on the wings of the Cecropia moth on the front cover, are commonly interpreted either as warning markings, to scare off enemies, or as "targets" to draw the enemy's attention to a non-vital spot. But moths get eaten anyway.—(Photo by Cornelia Clarke).

much counter to one of the most widely accepted of evolutionary sub-doctrines, but facts are facts, and Mr. McAtee as a proper scientist is not the man to avoid them.

It would be impossible to discuss all of the hundreds of cases cited by Mr. McAtee, but his point is well established even by a few familiar ones, either from his own list or suggested by his examples.

The common potato beetle is often put forth as an excellent case of warning coloration. It is ill-smelling, to human noses at least, and is credited with being nasty-tasting to birds and other enemies. It is brightly marked in black and yellow, and makes no attempt at concealment. Its pestilential abundance is commonly accredited to immunity to natural enemies. Yet Mr. McAtee has found records of its presence in the stomachs of no less than 27 species of wild birds, and he states further that ducks, chickens and guinea fowl are known to feed on potato beetles. In addition to this score and a half of feathered foes, he lists snakes, frogs, toads, ten species of predacious bugs, fifteen species of beetles, robber flies, wasps, spiders and two spider-like creatures less known to the general public.

Potato Beetle's Markings No Help

"Despite all of its protective adaptations," Mr. McAtee remarks, "the Colorado potato beetle undoubtedly has its full quota of foes; its rapid increase and spread over the United States was due to enormous increase by cultivation of a favored food plant and not to lack of enemies."

Perhaps the most familiar and most widely cited case of mimicry is that of the monarch and viceroy butterflies. Both of these are fairly large, brightly marked insects with a background color of dusty red or orange. The monarch is supposed to be ill-tasting to birds. The viceroy is not, but is supposed to obtain protection by looking so much like the monarch that only a student of insects can tell them apart. Yet both monarch and viceroy pay toll in thousands to birds and other enemies—taste, color and all to the contrary notwithstanding.

Bees, ants and wasps are supposed to be recognizable as bad eating by all possible enemies, and their mimics are supposed to gain protection from their mimicry. Yet stingers and stingless alike are snapped up without discrimination by everything from birds to toads. Mr. McAtee cites the case of one toad gorging himself on bees, in spite of the fact that they apparently used their stings inside him! And toads themselves, though clod-colored and exuding poison from some of their "warts," are in their turn eaten by snakes, skunks, and many other predators.

Monkeys Eat Spiders

Bright-colored spiders, like the common yellow-and-black orb weaver, are pointed out as good examples of "warning" coloration. Yet the most poisonous spiders, as well as the biggest, are earth-colored species that live on or close to the ground, and might therefore be called "protectively" colored. But in spite of their poison, and regardless of either "warning" or "protective" coloration, spiders get eaten. Birds, toads and wasps lead their manifold list of enemies in our temperate region, while monkeys delight in munching fat tropical spiders whenever they can catch them. And the spiders' kin-creatures, the centipedes and scorpions, fare no better. All are eaten by something or other.

Down in the sea there are brightly-colored fishes—presumably warningly colored, for some of them are poisonous. Nevertheless they get eaten. Sometimes the eater dies of the poison, more often not. And for the most part one experience will not teach him to avoid such fish in future, for the memories of fish are notoriously short: it is a common experience among anglers to have a fish bite again at a hook from which it has just succeeded in shaking itself loose. And even if a poisonous fish, or any other poisonous creature, should make its eater sick or even kill him, of what avail is that? Its poisonousness has no "survival value" to itself, Mr. McAtee points out, for it quite obviously has not survived.

Among the higher vertebrates, perhaps there is no better example of "protection" than the skunk. It may not be able to punish its attacker with death, but it is abundantly able to make him wish he were dead. And the broad white stripe down its dark back, together with its creamy tail, have been cited over and over again as warning signals. But what happens to the poor woods-puss? The three nocturnal hunters of his own habitat that are big enough to overcome him make a meal off him at their pleasure: owls, mountain lions and bobcats are all known enemies of skunks.

Thus from lowest to highest among animals, all are meat to some other creature, and no development of protective adaptation avails to save them. Over and over again Mr. McAtee emphasizes that the only principle that seems to rule is the relative abundance of individuals. The more there are the more get eaten, but the more survive.

If there is any moral in all this, Mr. McAtee does not point it out. The only one even mistily visible would seem to be one quite unpopular at present: that it is sheer numbers of progeny, rather than cleverness in equipping them for getting along in life, that promises survival and success to a species.

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Science News Letter, October 1, 1932

PHYSIOLOGY

Drinkers More Susceptible To Poisoning by Cleaning Fluid

DON'T use carbon tetrachloride if you have a "hang-over." This chemical, widely used for dry cleaning, cleaning machinery, as a fire extinguisher and in the treatment of hookworm disease, is often poisonous, and particularly so to persons who drink alcoholic beverages or who do not get enough calcium in their food.

Seven employees of a felt manufacturing plant, all wine drinkers, were poisoned by carbon tetrachloride when they used it in large quantities for cleaning the felt, Dr. L. W. McGuire of Boston has reported to the American Medical Association. When the fluid was used in small amounts to remove individual spots, the men had not been affected by it. When the felt was passed through a large, warm bath of the chemical, all the men become ill and one nearly died.

Calcium lactate or calcium chloride are successful remedies for treating carbon tetrachloride poisoning, Dr. McGuire stated.

Science News Letter, October 1, 1932

ZOOLOGY

Big South American Toad Devours Young Alligator

IF JONAH had swallowed the whale, that would have been real news.

A somewhat similar feat in the lower animal world has been accomplished by a toad that swallowed an alligator.

A short time ago, reports Dr. C. W. Parsons of the University of Glasgow, four giant toads from South America were received by his department. They were six inches long and three inches wide. They were put in the same vivarium with a couple of young alligators, about eleven inches long.

For a time all went well. The toads dug burrows in the sand, and fed contentedly on the semi-cannibalistic diet of frogs which was offered them. The alligators basked on the roof of a shelter, or swam about in the water. Both parties ignored each other.

Then came a morning when Dr. Parsons sought the 'gators, to remove them to a new home. He found only one of them, though he searched the laboratory high and low. On suspicion, he X-rayed the four toads. Sure enough, a dark shadow in one of them betrayed the whereabouts of the luckless young alligator.

Science News Letter, October 1, 1932

FORESTRY

Forest Fire Situation Worst in California

CALIFORNIA is the only National Forest area that is causing the U. S. Forest Service really acute concern over fire danger. Although the 160,000-acre brush fire that threatenend a part of the vital watershed area of Southern California was finally brought under control, there is a great deal of potential kindling all over the state. No rain has fallen for months, and none is in sight. For this reason National Forest Region No. 5, which is the only such region made up of a single state, is marked as "very unfavorable" in the Forest Service's latest summary.

"Unfavorable" regions include numbers 3, 4 and 5, ranging from Washington on the north to New Mexico on the Southeast. Here drought conditions are in general bad, but not as bad as they have been in California. In Regions 1 and 2, which take in the northern and central Rockies and the Plains states east to the Missouri, conditions are listed as favorable. Favorable also are conditions in Region 9, comprising the upper Mississippi and Great Lakes states. Here there have been few fires, and on the whole adequate rains.

In the East and South, Region 7, taking in all the seaboard states from Maine through Florida to Texas, is listed as "unfavorable." Through much of this territory there has been a severe late-summer drought, and hundreds of short-lived but quick-running fires have had to be fought.

There have been more than 5,000 forest fires throughout the country during the current year. Of these, approximately forty per cent. have been caused by smokers, campers, steam-engines and other human agencies. The rest are due mainly to lightning. Man-caused fires predominate in the East, accounting for over ninety per cent of the total. In the West, lightning is the more frequent cause of forest fires.

Science News Letter, October 1, 1932

ARCHAEOLOGY

Plaster-Stiffened Flags In 6000-Year-Old Tomb

TWO LINEN OBJECTS resembling flags, covered with plaster, are among the unusual finds recently discovered in tombs dating back to about 3900 B. C. at Armant, Egypt, and shown at the Wellcome Museum, London, in a temporary exhibition by the Egypt Exploration Society. One of the "flags" has a pattern, white on red, something like a St. Andrew's cross; another has a design of concentric rings.

"Such objects were not known before in predynastic tombs," said T. J. C. Baly, a member of the exploring group, "and their symbolic meaning is uncertain."

Two quartz beads, also found at Armant in a tomb dating to about 3600 B. C., glazed in the particular Mesopotamian fashion of that period, indicate that trade relations existed between the two countries in predynastic times, the director of the Armant Excavations reported.

Even more surprising are some amber beads which were apparently brought from the Baltic shore, possibly down the Danube valley to the Black Sea and thence to Egypt.

The work of exploration was carried out last winter, largely through the support of Sir Robert Mond, president of the Egypt Exploration Society.

Science News Letter, October 1, 1932

IN SCIE

PHYSICS

Light Speed Not Varying With Passage of Time

THE VELOCITY of light is not decreasing with the passage of time, Prof. Roy J. Kennedy of the University of Washington has concluded as the result of experiments carried on at the California Institute of Technology. M. E. J. Gheury de Bray recently suggested from an examination of measurements published over a period of decades that the velocity of light may be decreasing slightly year by year.

Prof. Kennedy will shortly announce to the American Physical Society that he has established experimentally the relativity of time. In a letter to *Nature*, he reports a test of the de Bray suggestion by means of experiments, and concludes that light does not have a variable velocity unless its frequency itself varies correspondingly to the supposed velocity change.

Science News Letter, October 1, 1932

PHYSIOLOGY

Strong Electric Current Makes Ameba Back Up

AMEBAE, lowliest of one-celled animals, do not like a too-strong electric current any better than we do ourselves, and if they encounter one will start for somewhere else immediately. How they do it has been studied by William F. Hahnert of the Johns Hopkins University, who will report his results in the forthcoming issue of *Physiological Zoology*.

An ameba, being only a naked bit of protoplasm, moves by just "oozing along," its living substance flowing in a slow current. When it meets a sudden increase in an electric current, its protoplasmic flow in front stops, and at its rear edge the flow reverses. If the current is weak, this pause is only momentary, and the ameba then keeps on going in the original direction. But if it meets a strong electric "jolt" it reverses itself and leaves the unpleasant neighborhood as fast as it can.

Science News Letter, October 1, 1932

FIELDS

PHYSICS

Storms Bombard Earth With Penetrating Radiation

WHEN lightning flashes, some form of penetrating radiation is shot heavenward and eventually reaches earth at a distant point probably through the influence of the earth's magnetic field.

This is suggested by Drs. B. F. J. Schonland and J. P. T. Viljoen of the University of Cape Town, South Africa, in a communication to the British scientific journal, *Nature*.

The penetrating radiation emitted by thunderstorms was detected by a Geiger-Muller counter and time signals and the radio atmospherics caused by the lightning flashes were recorded on the same electric chronograph. During certain distant storms the number of coincidences between kicks in the counting device and lightning flashes were considerably more than can be ascribed to chance. Storms overhead did not show systematic coincidences.

Science News Letter, October 1, 1932

CHEMISTRY

Nobel Prize Winner Finds Second Respiration Ferment

A SECOND respiration ferment, one that is not the haemin which controls the conveyance of oxygen from the lungs to the muscles and other tissues of the body, has been found by Prof. Otto Warburg, Nobel Prize winner, and his associate, Dr. Walter Christian, of the Kaiser Wilhelm Institute for Biology in Berlin.

Prof. Warburg's demonstration of the constitution and action of haemin was one of the significant contributions that won him the Nobel prize in medicine and physiology in 1931. Now he describes in a preliminary report to *Die Naturwissenschaften* his discovery of this second oxygen-carrying ferment.

When certain cells, called anaerobic because they normally cannot live in the presence of oxygen, are shaken up with oxygen, a respiration or burning of carbohydrate takes place, Prof. Warburg and Dr. Christian found. This respiration or breathing cannot be stopped by carbon monoxide or by hydrocyanic acid, poisons which stop ordinary respiration in animals by acting upon the haemin that controls the conveyance of oxygen in the body.

Juices squeezed out of many other cells behave like anaerobes. In such juices the Berlin investigators also found respiration which cannot be stopped by either carbon monoxide or hydrocyanic acid. From these observations they concluded that an oxygen-carrying ferment other than haemin is to be found in nature.

The second respiration ferment appears to be present in high concentrations in anaerobic cells. It is an orange colored substance that breaks down when heated for ten minutes at a temperature of 60 degrees Centigrade. Prof. Warburg and Dr. Christian described its absorption spectrum and the other physical and chemical properties which they had observed.

Science News Letter, October 1, 1932

ENTOMOLOGY

Grasshopper Plague Nipped By Early Summer Rains

GRASSHOPPERS, feared as an impending plague at the beginning of this summer, failed to reach destructive numbers largely because of timely rains. In places where rain did not stop them baits of arsenic-poisoned bran served to hold them in check.

Rains were effective in Iowa, South Dakota, Nebraska and Kansas. They fell most heavily during early summer, when the hoppers were just emerging from the eggs or were crawling about in their youngest growth stages. The rains either battered and drowned them outright, or encouraged the growth of parasitic fungi which killed them, or caused such rank growth of wild plants that there was food for them outside the cultivated fields.

Rains were less abundant in Minnesota and North Dakota, but here the people were awake to the danger, and got in their poison campaign in time.

Grasshoppers will do no more damage this season, for egg-laying time has arrived, and the insects feed very little now. Field researchers of the Bureau of Entomology are preparing to make a comprehensive egg survey, to estimate the prospects for a grasshopper year in 1933.

Science News Letter, October 1, 1932

GEOGRAPHY

New Low Pass Discovered In Rockies

A NEW LOW PASS through the Canadian Rockies which promises eventually to be traversed by a railroad to carry Peace River district wheat to the Pacific Coast was discovered in 1926 by Prentiss N. Gray, British scientist, who has just reported his discovery to the Royal Geographical Society.

Traveling in the last unmapped area of the Rockies that gave no indications that it had ever been visited before, Mr. Gray found the low pass through the continental divide. Tucked away in a dense growth of spruce timber only 4,250 feet above sea level, it is at the headwaters of an unexplored river called the Narraway. With wide meadows, Gray pass looked more like a ranch than a top of the Rockies. A chain of three lakes, which were named Sherman Lakes, lay in the pass. When ice is melting from extensive glaciers that overhang the northern rim, these lakes flow together, but at low water the southern lake drains through Barbara River to Fraser River and to the Pacific. The other other two lakes form the source of the Narraway, draining through the Peace River to the Arctic Ocean.

Gray Pass will allow a railroad to be built over a distance of 165 miles from Beaverlodge, Alberta, to a junction with the Canadian National Railway at Dome Creek in British Columbia. When this railroad is built, it will not be necessary to send wheat grown in the Peace River area eastward to Edmonton in order to ship it to the Pacific Coast.

Science News Letter, October 1, 1932

BOTANY

Arabs Use Fish Poison Mentioned by Pliny

THE ARABS of Palestine and other parts of the Near East are still using the same plant for fish poison that was mentioned by the Roman author Pliny in the first century A. D. as a common means for killing fish. It is the cyclamen, widely used as a potted plant. The Arabs' use of cyclamen for catching fish has been noted by Dr. Ephraim Ha-Reubeni of the Hebrew University in Jerusalem, in the course of his study of Arabian plant lore. Two other plants, styrax and mullein, are also used by them as fish poisons.

Science News Letter, October 1, 1932

PHYSICS

The Gyroscopic Compass

"A Classic Invention"

Sperry Pointed the Axis of Foucault's Gyroscope at The Pole Star and Learned How to Make It a Compass

GYROSCOPIC COMPASS, by Elmer A. Sperry, of Brooklyn, N. Y. Specification forming part of Letters Patent No. 1,279,471, dated Sept. 17, 1918. U. S. Patent Office.

To all whom it may concern:

BE IT KNOWN that I, Elmer A. Sperry, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Gyroscopic Compasses, of which the following is a specification.

The gyro-navigation equipment forming the present invention embodies a number of features including master, and may also include repeater, azimuth indicators, one or more of which may be power driven; the employment of an entirely new principle consisting in utilizing a rotating wheel and attached parts, as its journal frame or wheel casing, and in simultaneously controlling its movements in a plurality of movements, these being so effected as to produce on the one hand a practical compass and on the other hand to accomplish a number of other functions essential to the proper operation of the gyroscopic compass, upon moving vehicles. To this end I have introduced a new organization known as an azimuth or azimuth moving unit organized to at once develop the requisite directive power from the rotation of the earth by a new process which I denominate positive orientation which effects a quick settling of the instrument upon the meridian and which also operates by a new method to extinguish oscillation in azimuth by a partial suppression of freedom of the gyro wheel about the vertical axis, thus combining in the present invention means for introducing stresses or movements in both elevation and azimuth and means for quickly reaching true meridional position, substituting mechanical suspension for liquid or mercury floats and affording marked advantages generally in a number of structural and operating details connected with the various features going to make up a practical instrument. One embodiment of my invention, by way of example, will now be specified and shown and the novel features pointed out in the claims.

The work of Leon Foucault in the middle of the last century upon the unique instrument produced by him "after eight years of assiduous superintendence" and to which he gave the name "gyroscope," because as he states, its varied operations "depend upon the rotation of the earth and are but varied manifestations of such rotation," reveals many very interesting and significant statements, upon careful scrutiny, and some far reaching deductions.

The work of this savant on the pendulous gyro with two degrees of freedom is well known and has been followed by many and while a compass on this principle is found to work on land, when placed on a moving body it is found to respond as any pendulum will to acceleration and deceleration pressures and to other numerous disturbances. This latter difficulty and the oscillation which it sets up are very serious draw-backs to its use at sea.

A very significant statement and one which seems to have been wholly overlooked in its bearing on the subject of gyroscopic compasses was communicated by Foucault with regard to his apparatus having 3 degrees of freedom.

This is contained in a document prepared by him in October, 1852, and reads as follows:

"One should understand, from the little that we have said of the construction of the apparatus, that this tore is supported by a sort of Cardan's suspension, analogous to that which supports chronometers and ship's compasses, with this difference only that the two concentric circles, instead of being in the same plane, are normally or in their average position, perpendicular one to the other. One of them plays round a horizontal axis represented by the two knife-edges arranged precisely in one straight line, while the other is movable about a vertical axis represented by a suspension consisting of a torsionless filament. If, at moment we put it in rotation, this body by its axis points at a star in the sky, during the whole time that the movement (spin) lasts this axis will remain pointing toward the same point of the firmament, and this in virtue of the inertia of matter, or for the very good reason that it is incapable of displacing itself or of altering its direction by itself. If, therefore, we select a suitable star, or if we aim at one of the points of the heavens which appear to be moving most quickly, the axis of rotation when carefully examined, will be found to share the same apparent movement and will gave emphatic evidence of the earth's movement. Of course, one should not point the axis in the direction of the polar star, because this star, not having any apparent movement, the instrument would act similarly and not indicate the earth's motion."

The question was long ago asked by me what better compass could one wish than that suggested by the last sentence; it orients perfectly and by adopting this form of suspension, with three degrees of freedom it is found possible at the same time to do away with the evils and errors introduced by "ballistics" and to neutralize the acceleration pressures and also oscillation with one and the same additional device.

Theoretically, as Foucault pointed out, a spinning gyro mounted for three degrees of freedom maintains constant the

Three chemical elements of Group V

Vanadium
Columbium
Tantalum

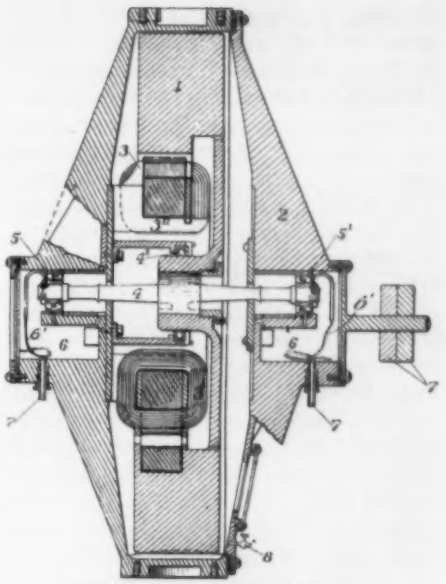
will be described by their discoverers IN THE NEXT CLASSIC OF SCIENCE

direction of its axis in space; and therefore if the gyro thus mounted, or even when mounted so that its movement about a horizontal axis at an angle to its spinning axis is partially suppressed, be placed with its axis pointing north and south or in the plane of the meridian, it should remain in this position so long as the gyro wheel continues to spin, no matter whether the gyro and its mounting, considered as a whole, be stationary relative to the earth, or in motion. When the gyro apparatus is stationary relative to the earth, the gyro axis does remain fixed in space; but when the gyro apparatus mounted in either of the ways just described is in relative motion, as for example when mounted on a moving vehicle such as a ship, movements of the vehicle acting directly and also acceleration and deceleration pressures caused by the various movements of the vehicle are communicated, by reason of the friction necessarily existing to some extent between the parts of the gyro's mounting, to the gyro wheel itself, upon which the said pressures are thus indirectly impressed in the form of disturbing torques of varying magnitude. These torques tilt the gyro axis and cause precession of the gyro into new positions where, in each instance, the axis assumes and tends to maintain a new direction in space. As a consequence, the gyroscope either having three degrees of freedom, or with one degree partly suppressed as described, will, if left to itself on a vehicle having variable speed, ultimately cease to indicate the meridian or any other chosen direction in which its axis was originally set, and will be erratic and untrustworthy. Moreover, such acceleration and deceleration pressures serve to exaggerate the oscillations which are found in practice to characterize a freely suspended gyro under all conditions; and the periods of these oscillations are so excessively great that apparatus subject to them is almost useless for the purpose of a compass.

However, when a gyroscope mounted for three degrees of freedom is combined, as in the present invention, with means for accomplishing positive orientation and for minimizing oscillations, a practical compass apparatus results which is accurate and dependable under all conditions of service.

In describing the gyro of the present invention as having three degrees of freedom I do not mean to imply that such freedom is absolute, but rather that the gyro may be non-pendulous. As a matter of fact, as will more fully hereinafter appear, freedom of motion about one or more axes is restrained or suppressed to a certain extent for the purpose of developing a positive orienting force. Considered by itself, the gyro of the present invention, in its most advantageous embodiment, may be in indifferent equilibrium; that is, the three axes about which it can move may intersect substantially at its center of gravity. According to the present invention the disadvantages inherent in the ordinary pendulous gyro, due largely to its being directly affected by acceleration pressures, are avoided; and by providing what may be termed latent restraining means for developing a positive orienting force, the erratic performance of the ordinary gyro having three or even only two uncontrolled degrees of freedom is transformed into perfectly dependable indicating action. At the same time all the important advantages of the pendulous gyro having but two degrees of freedom are retained in the present apparatus, and notably the tendency of the gyro always to seek the north. This is brought about by employing means, herein shown as structurally separate from or external to the gyro and its universal movement support but operatively connected thereto, for partially limiting and constraining the gyro axis to movements largely in one plane which, in practice is a horizontal plane. The restraining means, in its most advantageous form, should be normally without effect on the freedom of the gyro, coming into play only when the gyro tends to wander from its proper position. As a matter of fact a gyroscope on a moving vehicle such as a ship does not, in general, point exactly north, the error being variable and depending as I have discovered, upon the speed, course and latitude of the ship. A device for correcting the apparent readings of gyroscopic compasses is described and claimed in my copending application Serial No. 634,595 of even date herewith.

The instrument of the present invention comprises means for developing and applying a positive force tending to tilt the axis of the gyro wheel one way or the other the moment the meridional position is departed from in the slightest degree. I have found how to utilize this means to produce a positive stress which is applied direct to the wheel or its journal frame or casing; not simply about one equivalent axis as has heretofore been the universal practice in attempts to solve this problem, namely the horizontal axis, but simultaneously about two equivalent axes lying normal to each other, the second being the vertical axis of orientation. There are, of course, different methods of carrying this important double function into effect. I shall confine my description to the preferred embodiment of one or two methods, selecting those most easily understood. Let us now suppose that near the suitably suspended gyro wheel casing we provide a suitable rigid part close at hand but structurally separate from the gyro to which first a constantly operating self-centering or centralizing connection is made, and second, a simple device, such as a retractile spring or pair of springs are attached. It is found that the springs or their equivalent means constantly restore the wheel and frame to their central position by utilizing its own motion or tendency to move; and what is probably most important of all, it is found that, by selecting an exact point of attachment and one which is to the correct amount eccentric to the vertical axis, a positive and automatic orientation may be introduced whereby the wheel is very quickly returned in azimuth to the meridian as soon as the axis tends to tilt, all this being brought about by the proper relation of some three forces acting in conjunction. Thus, an entirely new element has been introduced into gyro compass operation, viz: that of forced and positive orientation brought about by an (*Turn Page*)



THE GYRO WHEEL

In vertical section; drawing from Patent No. 1,279,471.

operating mechanism of a predetermined activity and moment connecting the directive factor of the compass with a relatively immovable or stationary part, such part serving as an anchor or abutment for developing the necessary force reactions.

It will be readily seen that I have thus secured a simple gyro compass and for the first time in the history of the art, a forced and greatly accelerated orientation coupled with perfect freedom from numerous disturbances and errors above pointed out for it is clear that a part for instance in a state of neutral equilibrium or "indifferent equilibrium," as Foucault forcibly puts it, cannot respond to the disturbances named owing to the fact that it is not possessed of ballastic properties which is the source of the difficulty. One detail remains to be added to make the apparatus complete, viz: that the anchor should turn around in azimuth with the gyro wheel so as to be always on hand to operate as a base for the positive orienting, restraining and correcting element. In avoiding mercury floats and employing Foucault's filament suspension, it is also necessary that no torsion should accumulate therein as the ship turns. To provide against this a sensitive and simple following up device has been adopted which instantly responds to the slightest azimuth movement of the wheel and therefore never permanently changes its azimuth relation therewith, thus accomplishing a number of essential functions among which are its use as the anchor for the positive orientation and correction element and at the same time as a support for the torsion suspension whereby the two ends of the torsion element practically always move together, barring a trifling lag existing for an instant between them and before the responding member has caught up, amounting usually to less than one-tenth degree. Therefore no permanent torsion can exist and the suspension is always held in the condition of maximum sensitiveness and in readiness to instantly respond equally to motion in either direction. The rigidity of this supporting and anchoring part will be seen to be more than sufficient for all needs when it is stated that it is geared solidly to a stationary part secured to the supporting body and positively driven as by a power motor.

The acceleration pressures mentioned are due principally to three causes, first, that of getting under headway, or while stopping either forward or backward; second, centrifugal forces in turning, while moving in either direction; and third, the acceleration pressures emanating from oscillation where the compass is located at a distance from the center of such oscillation.

Science News Letter, October 1, 1932

RADIO

The Science Service radio address next week will be on the subject,

GASTRIC ULCERS

by

Prof. Harry Singer

Head of the Department of Neurology and Psychiatry at the College of Medicine of the University of Illinois

FRIDAY, OCTOBER 7

at 2.15 P. M, Eastern Standard Time

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GEOLOGY

Wind May Have Blown Chilean Salts from Rocks and Sea

AGREEMENT is being reached as to the most scientific explanation to account for the formation of the valuable constituents—nitrate and iodine—in the vast natural chemical storehouse that stretches for nearly five hundred miles along the length of the "tapeline" republic of Chile. A plausible theory at first advanced averred that guano, deposited by the birds that inhabit the coastal region, was responsible.

Some scientists then claimed that an upheaval of the sea bed had occurred, resulting in the exposure and decomposition of seaweed—a theory that accounts also for the presence of iodine.

Fixation of atmospheric nitrogen by lightning formed the basis for a third supposition, and still another claimed that the deposits were caused by the action of nitrifying bacteria on alluvial soil.

Then came the suggestion that volcanoes, of which the Andean region has many, were responsible. The contention was raised that nitric acid, formed by the oxidation of released ammonia, combined with alkaline earths from rock formation and resulted in nitrate. This seemed a logical explanation, but it failed to account for the presence of the iodine.

A recent supposition, which seems to meet all objections advanced to date, emphasizes the value of an intimate knowledge of local conditions in a study of this character. A Scandinavian geologist, Bjarne Hofseth, was impressed with the strength and regularity of the winds that commence each day at noon to blow over the pampas, as the stretch of desolate waste is called. He estimated that a daily wind movement occurred of about one hunderd kilometers, carrying minute amounts of dessicated salines, the products of rock decomposition and evaporated sea spray. Basing calculations on the assumption that the deposits have taken 100,000 years to form, Mr. Hofseth shows that a crust of nitrate and other soluble salts accumulating at the rate of only one-tenth of an inch every fifteen years would be sufficient to account for the existing and exploited reserves, the commercial development of which began about a century ago.

A heavy dew characteristic of this region, known as camenchaca, may well have effected dissolution of the salts and their precipitation in the ground. Periodic changes of climate, caused by the conflict of the Humboldt current from the cooler, southern seas, and a warm current from the north, known as El Nino, bring torrential rains at fairly regular intervals of about fifteen years, to vary the monotony of daytime aridity. A concensus of opinion is favoring the assumption that at such periods a further dissolution and recrystallization of nitrate occured; and so the deposit was finally formed as it is now being mined. It is a narrow horizontal stratum, or rarely two or more superimposed strata, usually at a maximum of only a few yards below the surface.

Science News Letter, October 1, 1932

AERONAUTICS

Largest Non-Rigid Airship Being Built at Akron

WHEN the TC-13, non-rigid airship under contruction at Akron, Ohio, makes its appearance in the skies as the largest ship of its type in the country, its occupants will be riding in a car streamlined into the inside envelope and suspended from inside cables.

Cars are suspended below envelopes from exterior cables on previously built army non-rigids in this country, and the change is only one of several planned for the cruiser.

Another feature not found on the previous Army non-rigids will be an observation car which can be lowered by means of a 1,000-foot cable while the TC-13 is hidden above clouds. The cable will also serve as an electrical conductor for telephone communication.

The new ship will have five control surfaces, a gain of one over earlier models. To provide for trim and expansion, two ballonets will be installed. The radio will have a range of 3,000 miles.

Two engines, each of 375 horsepower, will be the motor equipment. These will occupy a central location on each side of the car. Gear of engines will be three to two in relation to operation of three-bladed propellers.

The car will embrace welded tubular construction. It will be covered with corrugated metal and fabric. Water, fuel and storage tanks will be placed overhead, conveniently arranged so as to be dropped in an emergency to create more buoyancy.

The car will accommodate three pilots, a navigator, two mechanics, a bomber and a radio operator. Besides sleeping quarters, there will also be storage space for a supply of bombs.

The new non-rigid is expected to have an average speed of 68 miles an hour, it was said. It will be 233 feet long and 54 feet in diameter at its largest point. Including car, overall height will be 69 feet. Helium gas capacity will be 360,000 cubic feet, as compared with 200,000 cubic feet of the army's biggest non-rigids at present.

The airship is being built by Goodyear-Zeppelin Corporation, which turned out the naval cruiser Akron, and which is building a sister ship, the Macon.

Science News Letter, October 1, 1932

EVOLUTION

NATURE RAMBLINGS
by Frank Thone

Aiders of Evolution

INSECTS, which in the opinion of some scientists may yet drive man off the earth, made the earth fit for man to live on in the first place.

It is a commonplace that all human life, indeed all higher animal life, depends on plants, and on the higher plants at that. Man eats bread and a large assortment of vegetables and fruits, he wears clothing of cotton and linen, he lives in houses built of wood. All these are products of the higher plants. He also eats meat and dairy products, wears wool and silk, rides horses and camels. These are animal products and services; but the animals must be nourished on plants. All flesh, both of man and his beasts, is grass.

But the plants that feed man and his beasts are products of an evolution in which insects played a leading part. Every school child knows the story of flower pollination, and the importance of insects as carriers of pollen. With only a very few unimportant exceptions, all the multitudinous plants that figure in our daily lives are seed plants, dependent either now or at some time in the past on pollination for their survival and evolution.

When seed plants first appeared, away back when coal was in the making, there were plenty of plant species, but not one of them fit food for man or beast. Even the first seed plants would have yielded precious little in food or fodder. But, aided by the insects which were then in the beginning of their long and varied history, these pioneer plants begat offspring that gradually shaped themselves into the kindlier plants that we know and grow today.

It may be objected that most of our timber trees, like pine and oak, as well as many of our food plants, like the grains, are wind-pollinated, and do not need insects. That is true, but it has not always been true. The grains and other grasses give evidence of having descended from lily-like plants. The story of the trees is not quite so clear, and it is probable that the pines and their relatives have always been wind-pollinated; but it is also not unlikely that the ancestors of the higher wind-pollinated tree species, like the oaks, originally bore bee-visited flowers. Even now bees and other insects swarm over their inconspicuous blossoms, gathering pollen and nectar, though they are no longer needed as carriers of the fertilizing dust.

Science News Letter, October 1, 1932

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PUBLIC HEALTH

Better Health of Depression Explained by Authority

By DR. S. J. CRUMBINE, General Executive of the American Child Health Association.

ONE OF the anomalous situations that may be noted at this time is that, contrary to what we might have expected from three years of depression and privation, the general mortality rate for the past year in the United States is lower than usual, and that the infant mortality rate for the same year is the lowest on record.

The question naturally arises, "How can this be? Do want and privation make for better health and long life, or are there other factors that despite the stress of recent years our general mortality curve continues its downward trend?"

No intelligent person will subscribe to the idea that hard times are in themselves an aid to health, but they probably bring with them compensating benefits.

In the first place, considering people as a whole, there have undoubtedly been fewer excesses in the way of eating, drinking and other physical pleasures during the past three years. Moreover there are marked indications that the intensive spread of sound information on essentials of diet has resulted in more effective use of the family's money for food. These obviously are constructive aids to health.

Secondly, community interest and enterprise has been and is assembled to fight want and alleviate suffering.

Thirdly, and over and above all, there have been operating the constructive force set in motion through departments of health, departments of education, the progress of scientific medicine, particularly in the field of preventive medicine, and through the educating and socializing influence of the voluntary health organizations. All these combine in accumulating and disseminating health knowledge, in the formation of health attitudes and in the practice of health habits.

While these compensating influences continue we may hope for an ever-increasing standard of public health and for continued low mortality rates to which we have as a nation become accustomed. At the same time it must be remembered that the cumulative effects of present undernourishment and privation may show more clearly in later years, especially in the form of lowered resistance to disease. Any attempt, therefore, to abandon or curtail the efforts of those agencies which are now doing so much to keep up health standards and promote health practices would be a fatal mistake.

Science News Letter, October 1, 1932

Archaeologists excavating ruins of about 2000 B. C., at Damghan, Persia, found the burial of a dancing girl whose body and hands were laid out in an elegant dancing pose, and who was decked with many beautiful ornaments.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of SCIENCE NEWS LETTER published weekly at Baltimore, Md., for October 1, 1932.

Washington } ss.
District of Columbia }

Before me, a Notary Public in and for the District of Columbia aforesaid, personally appeared Watson Davis, who, having been duly sworn according to law, deposes and says that he is the Editor of the SCIENCE NEWS LETTER and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Editor, Watson Davis, 21st and Constitution Ave., Washington, D. C.

2. That the owner is:

Science Service, Inc., 21st and Constitution Ave., Washington, D. C., a non-profit corporation without stock, operating as the Institution for the Popularization of Science.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Watson Davis,
Editor.

Sworn to and subscribed before me this 21st day of September, 1932.

[SEAL]

Charles L. Wade.

(My commission expires April 6, 1933.)

PSYCHOLOGY

Splitting of Psychology Into Two Sciences Urged

THE division of psychology into two distinct sciences was urged upon the American Psychological Association by Dr. Robert M. Yerkes, director of the Laboratories of Comparative Psychobiology of Yale University. It would clarify the situation now existing, where principles are in dispute and there are conflicting schools and cults, to have one science centered on man and using introspective methods with a social and philosophical discipline, and another objective, a natural science, he said. He would call them psychology and psychobiology.

Science News Letter, October 1, 1932

A card catalogue of weather terms, kept at the U. S. Weather Bureau, contains almost 15,000 items.

CHEMISTRY

Chlorine Tied to Natural Gas To Give Cheaper Chemicals

THE MANUFACTURE of valuable industrial products from natural gas by the aid of the powerful chemical chlorine, a project long desired by chemists, is now in sight. Recent investigations of H. B. Hass and E. T. McBee of Purdue University are bringing to light the chemical laws by which the obstreperous chlorine may be controlled.

Molecules Broken Into

Organic chemists have realized for decades that the so-called hydrocarbons of which natural gas is composed are very closely related in formula to such valuable and relatively costly products as chloroform, formaldehyde, and several kinds of valuable alcohols. Although natural gas has appeared in stupendous quantities, nobody has yet succeeded industrially in making the necessary substitutions of atoms in its structure which would yield the above products. Apparently chlorine is about the only chemical agent which will break into the refractory molecules of the gas and give the manufacturer a chance to elaborate the desired substances.

Unfortunately chlorine in the past has behaved like a wild horse, doing all sorts of violence to the material under treatment. No consistency of production was attainable, and the process was hazardous. In such work it was always worth remembering that chlorine was the first poison gas used in the World War.

Many Products Possible

Following the recent success of a Philadelphia manufacturer in chlorinating light gasoline, yielding valuable solvents, Messrs Hass and McBee have worked out experimentally the chemical rules of the game by which chlorine can be controlled. Among other items, it is found that the operations proceed quite differently at dull red heat than they do at room temperature. Much of the investigation is a highly technical reckoning of the proportionate yields of two or more products in each case where the chlorine performs more than one act at a time. The aim is now naturally to slow down the undesired act, and emphasize the useful process.

Perfection of these processes will mean an almost unlimited supply of some very useful liquids, ranging from anaesthetics to lacquer solvents and even whisky. For this enterprise there will be required, in addition to the natural gas, only such readily available agents as electric power, common salt and coal.

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ARCHAEOLOGY

Graves Suggest Origin of Plague Burial Custom

SKELETONS lying in their graves face down, others on their backs but with their skulls detached and placed between their legs, others subjected to still further indignities, all discovered in a fifth-century burial ground near Breslau, Germany, suggest the possible origin of strange things done with the dead in medieval times when the plague was in the land, and continued in outlying communities even today.

The remarkable find is described and discussed in the German scientific periodical *Forschungen und Fortschritte* by Dr. Lothar F. Zotz, curator of prehistoric monuments in Breslau.

The burial place, Dr. Zotz states, contained a great mixture of grave styles. In many the dead were laid out in an orderly, "comfortable" position on their backs or sides, with rich gifts of weapons and ornaments. Mingled with such burials were the others, in which the corpse had been treated as though it were hated or feared. Some of the corpses had not only been decapitated, as indicated by the displacement of the skull, but were buried with the feet tied, and sometimes the hands bound as well. Some of the graves were shallow, and contained two or more burials apiece.

Two of the burials showed singular indignities: one had a big piece of bone between its jaws, its position indicating that it had been jammed down the throat; the other had a great rock weighing down the skull.

The suggestion that those maltreated corpses were those of enemies or captives Dr. Zotz does not accept. He points out that the normal and abnormal burials are all mixed together in most brotherly fashion, something unlikely to be done for an enemy. But he thinks he has a clue in certain burial customs that were resorted to during plagues in medieval Europe.

The idea prevailed then, and remains in some places even now, that corpses of persons dead of the plague first ate the burial gifts placed in their graves, then their grave-clothes, and finally began devouring their living relatives and friends. To prevent this vampirish behavior the dead were treated exactly as they were in this graveyard of a thousand years before: buried face down, or decapitated, or gagged, or mutilated.

The Breslau burial ground was filled with its dead during the time of the great folk migrations that finished the Roman empire in the West and ushered in the Dark Ages. Dr. Zotz inclines to the belief that this Germanic tribe, in its more or less temporary abiding place, fell victim to an epidemic. At first the burials were dignified and decent, but as the plague waxed worse, hasty and abnormal burials were resorted to in the effort to quell the unappeasable appetites of the ghoulish dead.

Science News Letter, October 1, 1932

SEISMOLOGY

Severe Earthquake Shakes Southeastern Siberia

SOUTHEASTERN Siberia, in the region of the Amur river, was shaken by a heavy earthquake on the morning of Friday, Sept. 23, according to calculations made by seismologists of the U. S. Coast and Geodetic Survey, based on data collected by Science Service. The quake began at 9:22.3 a. m., eastern standard time, and was centered in 50 degrees north latitude, 135 degrees east longitude, approximately. Since the region is off main lines of communication, it may be weeks or months before direct word of the disturbance comes out.

Seismograph observatories reporting to Science Service were the Seismological Laboratory, Pasadena; the University of Pittsburgh; stations of the Jesuit Seismological Association at St. Louis University, St. Louis, Mo., Georgetown University, Washington, D. C., and Canisius College, Buffalo, N. Y.; and stations of the U. S. Coast and Geodetic Survey at Sitka, Alaska and Honolulu, T. H.

Science News Letter, October 1, 1932

• First Glances at New Books

Biography

PAST YEARS—Sir Oliver Lodge—*Scribner's,* 364 p., $3.50. The Nestor of modern physics, who has spanned in his lifetime the whole transition from a science that was heavy, solid, "finished," to a physics that is now almost metaphysics, at last puts forth his autobiography: it makes fascinating reading. Neither does he neglect his interest in psychic investigations; and in the opening chapters he relates a boyhood incident or two that may help to explain his predilections in this direction.

Science News Letter, October 1, 1932

Paleobotany

THE STORY OF FOSSIL PLANTS—Edward W. Berry—*Brooklyn Botanic Garden,* 29 p., 40c. Designed primarily as a guide to a series of transparencies in the Brooklyn Botanic Garden, this booklet is easily adaptable to a much wider use, for the text is really an admirable summary chapter on the evolution of plants, and the full-page illustrations, from photographs of the transparencies, give good ideas of what ancient forests must have looked like.

Science News Letter, October 1, 1932

Geology-Ecology

A METHOD OF ESTIMATING GROUND-WATER SUPPLIES BASED ON DISCHARGE BY PLANTS AND EVAPORATION FROM SOIL—Walter N. White—*Govt. Print. Off.,* 105 p. 4 pl. 1 map, 20c. Working in a dry country (the Escalante Valley of Utah), the author has developed an ecological method of gauging water stored in the ground, which will undoubtedly be of interest and value to plant scientists as well as to earth scientists.

Science News Letter, October 1, 1932

Meteorology

AIRGRAPHICS—Alexander McAdie—*Blue Hill Observatory,* 37 p., $3.50. A useful compilation of diagrams, symbols, conversion tables, formulae and definitions relating to meteorology, particularly aerostatics and aerodynamics.

Science News Letter, October 1, 1932

Botany

FLORA HAWAIIENSIS—Otto Degener—*Author* (*Honolulu*). A well worked out, excellently illustrated flora, which will be welcomed both by botanists resident in the Hawaiian Islands and by visitors who have a little time to spend in studying their remarkable indigenous vegetation. This book is published as single leaves punched for a loose-leaf binder, with description on one side and an accurate line drawing on the other. This makes for flexibility, as well as for ease of revision and insertion of new species when found and described.

Science News Letter, October 1, 1932

Evolution

EVOLUTION YESTERDAY AND TODAY—Horatio Hackett Newman—*Williams and Wilkins,* 171 p., $1. This newest addition to the Century of Progress series summarizes in clear-cut, readable fashion the present status of the doctrine of evolution, differentiating correctly yet without confusion between known fact and permissible inference.

Science News Letter, October 1, 1932

Physics

RAMBLING THROUGH SCIENCE—A. L. De Leeuw—*McGraw-Hill,* 320 p., $2.50. A breezily informal presentation of the elements of the newer physics. Abstruse principles like relativity, the probability theory, atomic chemistry, etc., are brought into terms of common understanding by means of simple homely comparisons. A good book to give to a person blessed with curiosity but not provided with any scientific background. It will make at least the beginning of a scientist of him.

Science News Letter, October 1, 1932

Psychiatry

THE PSYCHOANALYTIC REVIEW—Editorial Board; Dorian Feigenbaum, Bertram D. Lewin, Frankwood E. Williams, and Gregory Zilboorg—*Psychoanalytic Quarterly Press,* $1 per issue, or $3 per year. A technical journal containing articles by leaders in this field, professional news, book reviews, and a bibliography of current psychoanalytic literature.

Science News Letter, October 1, 1932

Aviation

THE SKYCRAFT BOOK—Laura B. Harney—*Heath,* 338 p., $1.08. The story of aircraft, simply told for younger readers; suitable for the upper grades or junior high school work.

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Evolution

THE HISTOMAP OF EVOLUTION—John B. Sparks—*Histomap, Inc.* (*Chicago*), $1. The whole tremendous pageant of the development of life on earth is here arranged in compact form on a single large chart, making it possible for the student to trace in a single vertical sweep the story of the evolution of any group of organisms, or to get a swift horizontal glance at the contemporary life of any given period. The time-scale is represented logarithmically, permitting more detailed treatment of the evolution of man. Of necessity, statements are categorical, but when read under the compiler's blanket caution they should not lead the reader astray. This Histomap will be valuable for school and college use, especially in general science courses.

Science News Letter, October 1, 1932

Psychology

THE PRINCIPLES OF PSYCHOPHYSIOLOGY: CEREBRATION AND ACTION—Leonard T. Troland—*Van Nostrand,* 446 p., $4. The third volume of a most interesting four-volume work, containing parts V and VI of the complete treatise. As the author says: "The study of cerebration should be the most fascinating and revealing of all of the branches of psychophysiology. Unfortunately, however, it is at the same time the most recondite, from the experimental point of view. Because of this fact, it is necessary to make liberal use of the method of hypothesis, and I have not hesitated to do this."

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Astronomy

A STUDY OF THE ETA CARINAE REGION—Bart J. Bok—*Hoitsema Brothers* (*Groningen*), 90 p., 1 folded chart. A detailed study of one of the most interesting regions of the southern Milky Way, distributed in this country as Harvard Reprint 77.

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Physics

EXPERIMENTAL PHYSICS FOR COLLEGES—W. A. Schneider and L. B. Ham—*Macmillan,* 259 p., $2.25. In this text, chapters are so grouped that students take up at the same time experiments illustrating laws which are governed by the same or by a similar set of physical principles.

Science News Letter, October 1, 1932

Science News Letter will secure for its subscribers any book or magazine published in the United States. Send check or money order to cover regular retail price ($5 if price is unknown, change to be remitted) and we will pay postage in the U. S. Address: Library, Science Service, 21st and Constitution Avenue, Washington, D. C.